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Title:

Comments: Dear Payette Forest Supervisor Keith Lannom and staff:

I would like to offer the following comments regarding the proposed Stibnite Gold Project. The plan of operations submitted by Midas Gold is not a bad start, but it is woefully deficient in several regards, particularly in the prediction of and mitigation of effects to surface water and groundwater quality.

The project should ensure that surface and groundwater quality is maintained or improved to meet Idaho state standards. Principle contaminants at the site are arsenic and antimony. Will the NPDES permit require the project to meet the state standard of 10 ppb for arsenic? Presently much of Meadow Creek regularly exceeds this standard. Will this out-of-compliance situation trigger regulatory action from day one of the project? Will a timeline for achieving compliance be developed and enforced as part of the NPDES permit? Who is responsible for compliance now? The same questions apply to groundwater standards.

Water quality monitoring is discussed in chapter 15 of the PRO, but there is no mention of remedial actions to be taken if contaminant concentrations indicate an increasing trend. Where is the monitoring loop closure? It needs to be stated that operations would be suspended until the causes of such an increase are identified and mitigation measures are implemented effectively. Is the present density and location of groundwater monitoring wells sufficient to promptly detect statistically significant changes in chemistry as mining progresses? The density may need to be increased in the immediate vicinity of the pits.

Potential sources of post-mining water contamination are waste rock, tailings, and new water/rock interactions in the remaining pit environment. Each one of the individual sources needs to be geochemically characterized, predictively modelled, and have effective mitigation measures designed if necessary. Although past mining of oxide ore has resulted in arsenic and antimony contamination without significant acid generation, this fact is of little predictive value since this project will be mining deeper sulfide ore which will produce an entirely different geochemical environment. I'm fairly certain Midas has done plenty of ABA and SPLP testing of core samples; where's the data? Will it be made publically available?

There are only three brief mentions of geochemical characterization studies in the Plan. The first at p. 9-6 states that the disposition of development rock would be determined using an "adaptive management strategy". Adaptive management may be a reasonable provision to include in a plan, but it provides no information for making pre-project predictions of water quality that would be useful in a NEPA analysis. There has to be an initial prediction made to adapt from. The paragraph alludes to the existence of baseline geochemical testing data, but the only further mention of the results can be found on pg. G-73 where it states that "...West End development rock is geochemically suitable for backfilling²¹..." The superscript in this statement implies the existence of a supporting document that is not part of the Plan. The third passing reference to geochemistry occurs on pg. G-67 where it says "The primary limitations of pit backfilling are that it must be shown to be a geochemically and environmentally appropriate alternative..." True enough. So that's it; a lot of major components of the plan (e.g. development rock storage, pit backfill, post-mining water treatment needs, etc.) hinge on the acid generation and metal/metalloid leachability potential of the ore and host rock, yet although some of this information exists, none of it is included in the PRO.

Waste rock would probably have highly variable potentials to generate acid or leach metals, with carbonates from the West End pit likely being the most benign (no data is provided in the PRO to support this assumption however), thus being a logical choice for backfilling the Yellow Pine pit. The waste rock backfill in the Yellow Pine Pit would have to have the highest degree of confidence that it is not acid generating or metals leaching since the EFSFSR would be routed back through it after reclamation. Would installation of an impermeable liner between the bulk backfill material and the channel lining substrate to create a hyporheic zone isolated from the adjacent groundwater offer further insurance against contamination? The question also remains whether there is sufficient volume of potentially acid neutralizing rock to not only fill the Yellow Pine pit, but to also blend with potentially acid generating (PAG) waste rock at the various development rock storage facilities. Perhaps not; hence the mention of the possible need for PAG storage cells (PRO p. 9-6). There is no further detail given in

the PRO regarding the design of such cells, the anticipated volumes, or their effectiveness in isolating such material from the environment. There is no mention in the PRO of storage options for rock having high metals leachability (quite possibly entirely different material from PAG waste rock). There are numerous points where either development rock or old spent ore from past operations is proposed for reclamation use assuming it is not acid generating, however I see no mention of evaluating such material for metal/metalloid leachability prior to use. For example, soil samples taken on top of the old Hecla heap by a U of I soil scientist a few years ago showed the highest arsenic levels he had ever encountered. It must be repeated; acid generation and metals leaching are two entirely different chemical processes and we know that arsenic and antimony leach in the current environment.

The pits remaining after reclamation are a possible source of water contamination. Issues with the backfilled Yellow Pit pit are mentioned above, but it is the other two pits that may raise more cause for concern. Both the West End pit and the Hangar Flats pit are expected to fill with water and become pit lakes. Many pit lakes have a tendency to undergo chemical evolution over long time periods to become significantly contaminated with dissolved metals. Both these pits will mine ore from highly mineralized fault zones containing groundwater that is exceedance of state standards for arsenic and antimony (see the FS report Analysis of the Potential Effects to Groundwater Resources from the Proposed Golden Meadows Exploration Project, 2015 for more detail on existing groundwater conditions). How will this water be disposed of and/or treated during mining? How will this water influence remaining pit lake chemistry after closure, especially given newly exposed rock and a zone of increased permeability in the pit walls resulting from blast fracturing? Although the presence of carbonates in the West End pit suggests some acid buffering capacity is likely, the high concentrations of arsenic and antimony are present in circumneutral water as might be expected from solubility/pH curves. Then again there are eH/pH stability fields in the presence of iron to consider, which is why the geochemistry of this system is quite complex and predictions need to be evaluated by someone well versed in this field. The situation at the Hanger Flats pit is likely to be very different in that this pit is excavated entirely in quartz monzonite, which has very little acid neutralizing capacity. After closure the pit will have an unreclaimed highwall nearly one thousand feet high encompassing rocks of the Meadow Creek fault zone. Surface drainage of unknown quality from this area will drain directly into the Hanger Flats pit. Presently some of the highest arsenic concentrations on the site are found in seeps likely related to old underground workings in the Meadow Creek fault zone. Meadow Creek and Blowout Creek would both be routed through the resulting pit lake. Have water quality predictions/modelling considered the option of isolating the pit lake from the surface water and the adjacent alluvial aquifer, or at least minimizing connectivity between them? Would surface water dilute contaminants derived from the pit, or exacerbate wall rock reactions? Have contaminant models been run for peak flow vs. base flow conditions? How long would it take for the pit lake to fill with or without surface water contribution? Obviously a pit lake directly connected to an ESA-listed fish-bearing stream better have very high-confidence predictions as to water quality. This particular uncertainty may prove to be such a significant factor as to warrant a project alternative that omits mining of the Hanger Flats deposit or limits it to underground mining of the high grade ore zones. Post-mining water treatment is often one of the greatest expenses accounted for in a reclamation bond especially long-term treatment (recognized as a possibility, PRO p. 14-28). Failure to accurately predict water quality would mean that if treatment is required, the taxpayer gets to pick up the tab once the reclamation bond money is refunded to the mining company.

Without access to the hydrogeochemical data it is impossible for me to comment further on this issue other than to say that in order to effectively analyze potential water quality impacts from this project the Forest Service must obtain the third party services of someone with a strong background in hydrogeology, geochemistry, and predictive numerical modelling in order to review the data, assumptions, and modelling (both completed and proposed) that support any predictions of post mining water quality. Such a review should address the following modelling questions:

1. Is the conceptual model reliable?
2. Have alternate conceptual models been considered?
3. What are the uncertainties from the presumed conceptual model?
4. Are there multiple working hypotheses for characterization and remediation scenarios?

5. Has the worst case scenario been considered as well as the best case scenario?
 6. How reliable is the code? How has the code been tested? What test cases were used and why?
 7. Is the code appropriate for the problem?
 8. How good is the code database?
 9. What are all the assumptions made in the modeling computations for water solution partitioning? What equilibrium assumptions were made and are they warranted?
 10. What form of the precipitating phase was used in the computations? The most stable form or the least stable form? Justify the choice.
 11. Was sorption used? What sorption assumptions were made and why? Have these been tested for similar conditions? How was effective surface area determined?
 12. If pH was simulated, what assumptions were made? What evidence shows that these assumptions are reasonable?
 13. Was a comprehensible sensitivity analysis performed? What are the most sensitive factors for the model output? How does the uncertainty in these factors affect the results?
 14. What is the temporal variability in contaminant concentrations and discharges? Has this been included in the inputs?
 15. Are predictions being made for longer periods of time than the history matching/calibration period?
 16. If the computational model is a forward geochemical model, were any inverse geochemical models considered as well?
 17. Was water quality input data screened for quality, e.g. charge balance, consistency of element ratios, etc.?
 18. Are minerals considered in the model based on observation at the site or a reasonable analog site?
- These comments constitute most of my water quality concerns; reclamation related comments to follow.

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